

New records of *Nasitrema atenuatta* and *Nasitrema globicephala* (Trematoda: Brachycladiidae) Neiland, Rice and Holden, 1970 in delphinids from South Atlantic

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ABSTRACT: Twenty one *Sotalia guianensis* (van Bénéden, 1864) and one *Steno bredanensis* (Lesson, 1828) stranded on Brazilian coast were necropsied. Two species of *Nasitrema* (Trematoda: Brachycladiidae) Ozaki, 1935, were identified in the respiratory tract of the dolphins. *Nasitrema atenuatta* (Neiland, Rice and Holden, 1970) was found in *S. guianensis* (prevalence 28.7%, mean intensity 4.66 and mean abundance 1.33) and *S. bredanensis* (mean intensity and mean abundance six helminths). *Nasitrema globicephala* (Neiland, Rice and Holden, 1970) was only found in *S. bredanensis*, with an infection intensity of 14 helminths. *Nasitrema atenuatta* and *N. globicephala* are reported for the first time in South Atlantic.

Helminths are the most diverse group of metazoan parasites of vertebrates, and are recognized as an important component of global biodiversity (Poulin and Morand 2004). Efforts directed to recording parasites species of cetaceans have increased in recent years, however, on the Brazilian coast, there are few studies concerning helminths infecting other organs besides the gastrointestinal tract (Santos *et al.* 1996; Marigo *et al.* 2010).

Trematodes of the genus *Nasitrema* infect the nasal cavity, the respiratory tract and nervous system of a wide variety of small odontocetes (Neiland *et al.* 1970; Dailey and Ridgway 1976; Forrester *et al.* 1980; Brieva and Oporto 1991; Dailey 2001), and can be related to individuals or mass strandings of these animals (Dailey 2001). Some studies indicate *Nasitrema* as the cause of eighth cranial neuropathy in Risso dolphins, *Grampus griseus* (Cuvier, 1812), in Japan (Morimitsu *et al.* 1992), cerebral necrosis in a common dolphin, *Delphinus delphis* Linnaeus, 1758, in California (Dailey and Walker 1978), encephalitis in striped dolphin, *Stenella coeruleoalba* (Meyen, 1833), and sinusitis and meningocephalitis in four species of dolphins in the North Atlantic (O' Shea *et al.* 1991; Degollada *et al.* 2002). The lesions resulting from infections by these parasites can cause loss of balance and interfere with the echolocation, which can induce the stranding or even the death of the animal (Dailey 2005).

On the Brazilian coast, non-identified species of the genus *Nasitrema* has been reported parasitizing the central nervous system of Risso dolphins, *G. griseus* (Maia-Nogueira 2000), the nasal cavity of bottlenose dolphins, *Tursiops truncatus* (Montagu, 1821), and the nasal cavity of estuarine dolphins, *S. guianensis* (Di Benedetto and Ramos 2004; Melo *et al.* 2006). None of these studies have mentioned the species identification.

Twenty-one specimens of the estuarine dolphin, *S. guianensis*, and a rough-toothed dolphin, *S. bredanensis*, found stranded on the beaches of Ilha Comprida, São Paulo state, Brazil (24°51'00" S, 47°40'00" W) between January 2011 and July 2012 were necropsied and flukes were collected from nasal cavities and lungs. Identification of cetacean species, biometry, and evaluation of decomposition stage of the carcasses followed Jefferson *et al.* (1993), IBAMA (2005) and Geraci and Lounsbury (2005). To collect the parasites, the dolphins' head were disjointed from the body and the nasal air sacs and sinuses were washed with water on a sieve (mesh 150 mm). The bronchi and lungs of the animals were sectioned and opened, respectively, and washed on the sieve. All trematodes collected were washed in distilled water and fixed in 70% ethanol. Subsequently, for each dolphin, samples of the best preserved worms were separated, stained with Semichon carmine or Delafield hematoxylin, clarified in beech creosote, measured and mounted on permanent slides according to Amato *et al.* (1991). The identification of the trematodes followed specific literature (Neiland *et al.* 1970; Walker *et al.* 1984; Gibson, 2005). Parasitological indices such as prevalence, mean intensity of infection and mean abundance were calculated according to Bush *et al.* (1997).

The analyzed specimens of *S. guianensis* were mostly adults (mean length = 173.00 ± 25.68 cm) and were in stage two or three of decomposition (Geraci and Lounsbury 2005). A total of twenty-eight specimens of the trematode *N. atenuatta* (Figure 1) were recovered in these dolphins. In two dolphins, trematodes were found parasitizing the nasal air sacs and sinuses, while in other four individuals they were collected from the bronchi and lungs. All parasites were in mature stage and producing eggs. Morphological measurements of trematodes and parasitological indices

are presented in Table 1. Few descriptions of *Nasitrema* species are known. Neiland *et al.* (1970) and Walker *et al.* (1984) presented comparative studies including size and some morphologic characters, where *N. attenuatta* is described with very bluntly lobed testes positioned on the first fifth or first sixth part of the body, ovary consisting of two or four blunt lobes and vitellaria beginning at anterior limits of anterior testis, whereas *N. globicephalae* is described with dendritic testes positioned on the second

quarter of the body, ovary consisting of five to 10 short and blunt lobes and vitellaria beginning in a zone extending from midway between ovary and acetabulum to equator of acetabulum. These morphologic differences were used in this study to distinguish the species (Figure 1 and 2). *N. attenuatta* was longer and slender than *N. globicephalae* and the difference in the distribution of vitellaria and testes were notable (Figure 1). Testes in *N. globicephalae* were pediculate with ramified (bifurcated) extremities (Figure 2A) whereas in *N. attenuatta* they had many finger-like lobes (Figure 2B). *Nasitrema attenuatta* has been found parasitizing the nasal air sacs of *S. guianensis* captured in Barranquilla, Colombia (Bossenecker 1978). In Brazil, non-identified species of the genus *Nasitrema* have been reported as parasite of *S. guianensis*, in the state of Rio de Janeiro (Di Beneditto and Ramos 2004; Melo *et al.* 2006). This is the first record of *Nasitrema attenuatta* parasitizing *Sotalia guianensis* in the South Atlantic.

The only *Steno bredanensis* specimen analyzed was an adult female (269 cm length), which was found stranded alive. Cause of death was not identified. Necropsy was performed 12 hours after natural death. Forty-five adult flukes were recovered from the nasal air sacs and sinuses. Twenty were stained and prepared to identification. The species *N. attenuatta* ($n = 6$) and *N. globicephalae* ($n = 14$) (Figure 1) were identified. Morphological data and parasitological indices are presented in the Table 1. Eggs of unidentified species of genus *Nasitrema* have been reported in the air sinuses from this dolphin species in the Canary Islands, North-Eastern Atlantic (Degollada *et al.* 2002). This is the first record of *N. attenuatta* and *N. globicephalae* parasitizing *S. bredanensis*.

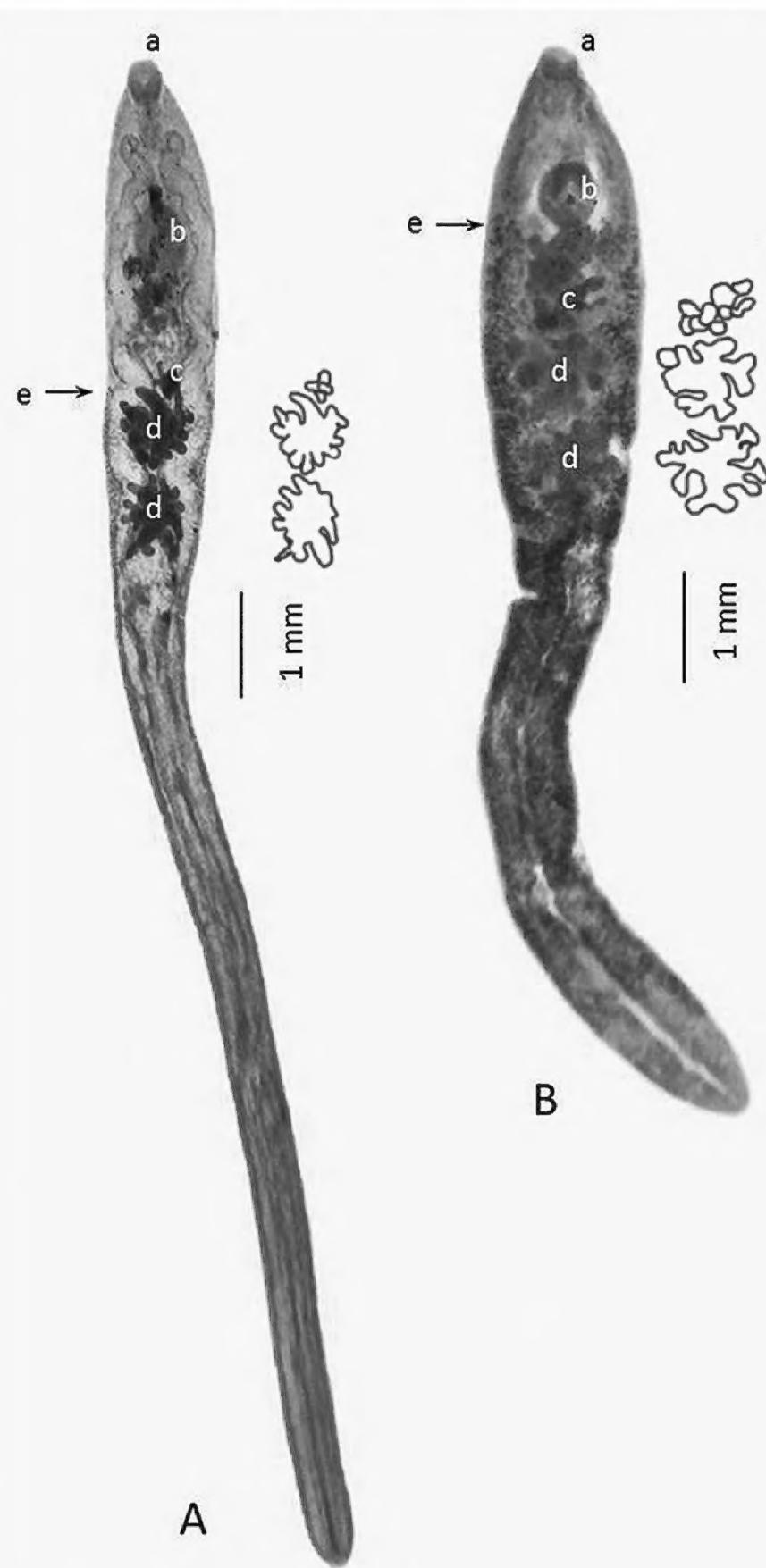


FIGURE 1. General view of *Nasitrema attenuatta* (A) and *Nasitrema globicephalae* (B) collected from *Sotalia guianensis* and *Steno bredanensis*, respectively, from South Atlantic. a. Oral sucker, b. Acetabulum, c. Ovary, d. Testes and e. Anterior limit of vitellaria distribution. Note very bluntly lobed testes positioned on the first fifth or first sixth of the body in A and dendritic testes positioned on the second quarter of the body in B. Ovary from *N. globicephalae* with more than five lobes. Testes and ovaries' drawings are reproduced beside the image.



FIGURE 2. *Nasitrema attenuatta* (A): ovary with few lobes (4, two of them superimposed) and testes with lobes no dendritic. *Nasitrema globicephalae* (B): Dendritic testis.

TABLE 1. Morphologic measurements and parasitological indices of *Nasitrema attenuatta* and *N. globicephalae* found in delphinids species from South Atlantic. Minimum, maximum and mean values (between parentheses) are presented.

Parasites species and morphologic measurements	Delphinids species		
	<i>Sotalia guianensis</i>		<i>Steno bredanensis</i>
	<i>N. attenuatta</i>	<i>N. attenuatta</i>	<i>N. globicephalae</i>
Body length	15.3-17.1 mm (16.1)	14.5-16.8 mm (15.6)	10.0-13.5 mm (12.1)
Body width	1.5-1.8 mm (1.6)	1.0-1.8 mm (1.5)	2.2-2.2 mm (1.7)
Oral sucker length	0.41-0.47 mm (0.43)	0.41-0.45 mm (0.42)	0.37-0.52 mm (0.44)
Oral sucker width	0.41-0.52 mm (0.46)	0.33-0.49 mm (0.42)	0.38-0.55 mm (0.46)
Acetabulum length	0.75-0.76 mm (0.75)	0.59-0.74 mm (0.68)	0.56-0.78 mm (0.66)
Acetabulum width	0.70-0.82 mm (0.74)	0.56-0.76 mm (0.68)	0.54-0.79 mm (0.67)
Egg length	0.05-0.09 mm (0.07)	0.07-0.09 mm (0.07)	0.07-0.09 mm (0.07)
Egg width	0.02-0.05 mm (0.04)	0.04-0.05 mm (0.04)	0.04-0.05 mm (0.04)
Testes	lobed	lobed	dendritic
Ovary	2-4 lobes	2-4 lobes	5-8 lobes
Vitellaria distribution	postacetabular	postacetabular	acetabular
Parasitological indices			
Prevalence (%)	28.57 (6/21)	100 (1/1)	100 (1/1)
Mean intensity	4,66 (28/6)	6 (6/1)	14 (14/1)
Mean abundance	1,33 (28/21)	6 (6/1)	14 (14/1)

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